

CHAPTER 2G
PILE CONSTRUCTION

2G-01. GENERAL

Information contained in this chapter applies in general to pile driving on any project; specific information pertaining to a particular project should be obtained from your supervisor and from the plans and specifications. If a conflict exists between this chapter and the contract plans and specifications, the contract will govern.

2G-02. GENERAL REQUIREMENTS

- a. Check use of pile. i.e.. point bearing or friction.
- b. Check whether piles are to be driven to refusal, a specified bearing or depth.
- c. Check workmanship, materials, and line and grade of completed work.
- d. Maintain all required records.
- e. Reject unsatisfactory materials.
- f. Check testing of materials.
 - (1) At source of supply
 - (2) On site
- g. Checks Prior to Driving
 - (1) Check pile lengths required and bearing capacity of piles.
 - (2) Check borings to determine the driving resistances to be expected and types of materials to be encountered.
 - (3) Check piles as delivered to site and mark piles which are not acceptable.
 - (4) Check piles for length and have lengths indicated on piles near top.
 - (5) Check piles made up for specific locations; have the piles location number painted on the pile.
 - (6) Check out pile driving equipment for size and condition. Check boiler inspection certificate and other safety requirements where steam or compressed air is used. Continue checking daily.
 - (7) Obtain and study the brochure printed by the pile hammer manufacturer pertaining to the hammer being used in order to learn of hammer capabilities and limitations.
 - (8) Check types of special piles and obtain the brochures or pamphlets put out by the manufacturers of these piles to become familiar with the methods of handling, inspecting and driving.

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(9) Check for pile numbering plan. Enter in your report the order driven.

(10) Check that heads are flat and smooth and are normal to the longitudinal axis.

h. Checks During Driving

(1) Check care in handling piles, overdriving, hitting obstructions, driving out of plumb, retardation of stroke and sequence of driving.

(2) Check strata into which piles are driven and depths. Check against profile of borings.

(3) Check that records include type of pile, length used, type and size of hammer, manufacturer, strokes per minute, blows per foot, number of blows per inch of penetration, elevations of pile butt and tip after driving.

(4) Check that approval is obtained for relocation of piles or driving additional piles.

(5) Check the behavior of the pile during driving.

(a) Check hardness of driving at various depths against the strata shown on the boring log.

(b) Check for deviations which indicate broken piles, obstructions or driving irregularities. Check inside length against outside markings.

(6) Check steel driving shoes used on wood or concrete piles. Check damage to pile tip by pulling an occasional pile.

(7) Check that piles are driven continuously. If driving is suspended, note the tip grade at the time of the shutdown and the duration of the delay.

(8) Check uplift on piles.

(a) Check when piles are driven in groups or clusters for heaving of earth around the piles.

(b) Check grade on piles after they are driven and later rechecked.

(c) Check with your supervisor if heaving occurs.

(9) Check that use of small tips is avoided. Check damage to tips on wood piles by pulling an occasional pile.

(10) Check for preparation of pile schedule and lengths.

(a) Drive several piles adjacent to boring locations.

(b) Note blows per foot for each foot.

(c) Compare (b) with boring data.

(11) Check that piles are set vertically, or, if batter piles, on the axis which they are to follow. Check that the hammer is centered over the pile.

(12) Check use of templates or timber bracing for guiding piles when driving without leads.

(a) Check deviation from proper location. Cut off and abandon and drive new pile.

(b) Pull and redrive.

(13) Check jetting is used only with approval of supervisor.

(a) Check depth jetting permitted.

(b) Check for walking out of plumb and loosening of piles previously driven.

(c) Check that piles are redriven after jetting in area is completed.

(d) Check possibility of damage to existing structures if jetting permitted.

(14) Check lagging is used only with prior approval.

(15) Check piles are not driven within 100 feet of concrete less than 7 days old.

(16) Check ownership and payment of pile cut-offs. Check if cut-off lengths are excessive.

(17) Make sure your records indicate pay lengths.

(18) Check deviations from pile schedule; notify your supervisor.

(19) Ensure pile driving is not started until approval is given as to the type and weight of the hammer to be used.

i. Site Conditions. Inspection of Equipment

(1) Check for unfavorable conditions such as rock, ledge, boulders not indicated on drawings, excessive soft spots, crusts, old foundations disclosed during construction, and report to your supervisor.

(2) Check site conditions, including lines, grades, foundation preparation, all available boring information, right-of-way, roadways, streams or other waterways, terrain, and all driving conditions.

(3) Check equipment proposed for use by the contractor will produce the finished work of requirement standards within the scheduled time.

(a) Check size of hammer.

(b) Check type of driving hammer bases, anvils and caps against type of piling.

(c) Check followers are used only with the approval of your supervisor.

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(d) Check condition of hammer for wear, improper adjustment, poor lubrication, long hose lengths, leaks and drops in steam pressure.

(e) Check double-acting and differential-acting hammers are run at manufacturer*s rated speeds.

j. Pile Driving Procedure

(1) Check with supervisor procedure to be followed.

(2) Check formula to be used as a guide in determining bearing capacity.

(3) Check minimum bearing value to be obtained if not stated.

(4) Check with supervisor for blows per inch (or fraction of an inch penetration) for the last ten blows to be obtained when driving to refusal.

2G-03. TESTS AND RECORDS

a. Tests

(1) Check test piles to be driven and method of loading.

(2) Check time required between driving and testing.

(3) Check test pile operation and log all data.

b. Records-Check daily job records of pile driving operations are complete and contain the following information:

(1) Site

(a) Depth of water (if any). (Condition of bottom if pile driver is in water).

(b) Elevation of water surface, tidal and stream flow or current observations.

(c) Elevation of ground surface.

(d) Ground-water elevation.

(e) Character of surface soil.

(f) Effect of pile driving on elevation of soil surface.

(g) Weather-Temperature, precipitation, high winds.

(h) Ground surface- Depth of frost (if any), wet, muddy, or dry.

(2) Location of Pile

(a) Identification by reference number on plan approved for field use.

(b) Actual location as driven and length of pile driven.

(3) Driving Record

(a) File Data - type and length used.

(b) Hammer Data - type and size and manufacturer of hammer used.

(c) Driving Data - blows per inch penetration, and elevation of butt and tip after driving.

2G-04. INSPECTION

a. Steel Pile - H Piles. Pipe Piles. Sheet Piling

(1) Check upon delivery grade and type of steel and mill certificates.

(2) Check diameter, weight and type.

(3) Check surface condition, condition of interlocks, condition of pile point and pile head reinforcing or shaping.

(4) Check bends of flange injuries in shipment or handling.

(5) Check for defective rivets or welds, and fit at splices.

(6) Check certification of welders.

(7) Check number of splices per pile.

(8) Check storage and handling methods.

(9) Check interlock dimensions for interchange and placing of piles for location, spacing, direction and threading of interlock of sheet piles.

(10) Check that driving operations do not rupture interlock.

(11) Check on enclosed sheet pile structures for accuracy of initial pile location and plumbness.

(12) Check last closure pile is driven free without jamming or causing damage of interlocks.

(13) Check splices are staggered, and allowable splices per pile.

(14) Check cutoff elevations and allowable tolerances.

(15) Check handling and pulling holes are provided.

(16) Check expansion and contraction allowances on walers.

(17) Check caps are not placed before sway bracing, welding, etc. is completed.

(18) Check concrete is not dumped in pipe piles through water.

(19) Check sheet piling is left slightly higher than cutoff elevation.

(20) Check every tenth sheet pile is pinned to prevent walking and to maintain plumbness.

(21) Check that steel pipe tops frayed or battered during driving are cut off.

b. Timber Pile (Round)

(1) Check type of timber as delivered.

(2) Check dimensions and straightness of the pile.

(3) Check for decay, knots, splits, shakes, crooks and bends.

(4) Check preparation of points and heads for driving.

(5) Check methods and amount of treatment required.

(6) Check removal of bark.

(7) Check treated timber piling is not handled with cant dogs, spike poles, or hooks.

(8) Check all cuts and breaks are treated.

(9) Check use of collars or bands.

(10) Check the head of a timber pile is recut, if broomed.

(11) Check that driving of piles beyond the point of refusal is not permitted.

(12) Check cutoffs for all structures.

(13) Check bolt holes.

(a) Check holes bored for drift bolts are 1/16-inch smaller in diameter than the drift bolt.

(b) Check holes in treated piles and timbers are filled with hot creosote and where not used tightly closed by a treated plug.

(c) Check that holes are not bored or spikes driven in treated piles to support scaffolding.

(14) Check treated piles are cut off only during favorable weather.

(15) Check cutting of treated spreaders, walers and piles is not done to permit fitting, unless approved.

(16) Check ends of bolts and tie rods extending more than 3 inches beyond the nut are cut off to that length. Ends of all bolts shall be bent or battered after the nut is tight.

(17) Check bolts and tie rods have at least 3 inches of threads remaining under the nut after tightening the nut.

(18) Check walers for overlap, each on each, and that proper number of piling is included in the overlap.

(19) Check washers for make, weight, shape and size.

c. Timber Pile (Sheet)

(1) Check on-site fabrication (Wakefield) for surfacing, grade and size of lumber; size and length of nails, spikes or bolts; proper dimensioning of fabricated work (tongue-and-groove dimensions); required nailing or fastening procedures.

(2) Check used Wakefield piling for tongue-and-groove dimensions, suitability of piling and proper lengths.

(3) Check painting of piles.

(4) Check nailing of driven piles is such as to prevent springing.

(5) Check liners and caps installation.

d. Concrete Sheet Piling

(1) Check tongue-and-groove interlocks are not chipped, cracked or broken.

(2) Check units are of uniform shape, true, and straight. Warped, bent or broken piles shall be rejected.

(3) Check interlocks are fully grouted, where watertightness is required.

e. Precast Concrete Piling

(1) Check quality of the concrete.

(a) Record concrete mix used.

(b) Check for conformance with approved mix.

(2) Check reinforcement is free from rust and scale and placed properly.

(3) Check casting yard operations for the following:

(a) Casting floor will be firm.

(b) Width of pallet boards.

(c) All cut ends of reinforcing tie wire are turned away from form surface.

(d) All inside surfaces of forms are smooth and clean.

(e) Chamfer strip (if required) is in place and firmly attached to form.

(f) Bracings and blocking between and around each piling firm.

(g) Check pile forms are level and straight with no openings.

(h) Check placing is continuous from start to completion, beginning at the head and working toward point.

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(i) Check top surface is secreted and brushed to a uniform, even texture similar to that produced by the forms.

(j) Check upon completion of placement, each pile is stamped or marked on head and point to indicate date and length.

(k) Check as soon as practical that the lifting and stack points are painted on each pile.

(1) Check curing.

(m) Check handling of pile is not permitted until the required strength has been attained.

(n) Check lifting cables are provided with some device to equalize the pull at all lifting points.

f. Cast-In-Place Concrete Piles

(1) Check quality of the concrete.

(a) Record concrete mix used.

(b) Check for conformance with approved mix.

(2) Check reinforcement for cleanliness and placement.

(3) Check the prepared pile hole, before placing reinforcement, to check full dimensions and to see that no swelling or movement of the soil occurs before placing concrete.

(4) Check identification of casings as delivered with those inspected and accepted at the manufacturer*s plant.

(5) Check the driven casing for ruptures and plumbness before placing reinforcement or concrete, when the casing is to be left in the ground.

(6) Check that prepared pile hole is free of water before placing concrete.

(7) Check the elapsed time after placing concrete before placing the load on the pile.

2G-05. INSTALLATION

a. General

(1) Check layout location for piles.

(2) Check template for sturdiness and elevation.

(3) Check pile hammer data before driving commences.

(4) Check boiler certificate is obtained from contractor if steam is used.

(5) Check handling of piles. Insist that pickup points be used.

(6) Check length and size of each pile for required location.

(7) Check penetration of pile immediately after setting and record in Daily Driving Log.

(8) Check alignment laterally, longitudinally and vertically; also batter lines (if battered piles are required).

(9) Check cushion condition beneath during actual driving operation.

(10) Check continuous driving until required depth or penetration is attained.

b. Concrete Pile

(1) Check that precast concrete piles are protected by means of driving heads.

(2) Check cast-in-place unit shells are thoroughly cleaned out with air or water jets and all water removed before concrete is placed.

(3) Check reinforcing steel is rigidly assembled, lowered into the shell, and adequately secured in proper position until concrete is placed. Loose bars shall not be permitted.

(4) Check provisions and method of cutting and splicing.

c. Driving for Resistance

(1) Check that the ram is operating at full stroke, rated speed, and under full recommended pressure.

(2) Check any evidence of slowing down of hammer.

(3) Check cushioning materials for conformance with those anticipated in the designer's resistance formulas.

(4) Check carefully the readings taken immediately after resumption of driving.

(5) Check inside piles are driven first, when piles are to be driven in groups.

d. Overdriving

(1) Check against overdriving when specific depths of penetration are unattainable due to some unforeseen condition underground.

(2) Check sound and character of vibration of the pile during driving for evidence of overdriving.

(3) Check bouncing of hammer or dissipation of the energy of the blow in bending or kinking of the pile, as indications of overdriving.

(4) Check with supervisors the advisability of pulling an occasional pile to check for damage from overdriving.

e. Tolerances

(1) Check permissible tolerances are maintained.

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(2) Check guides and templates are used to secure proper alignment until penetration is sufficient to determine its course.

(3) Check springing of piles during driving to bring them into proper alignment.

(4) Check tolerance in aligning and plumbing foundation piles which are to be buried.

(5) Check accuracy of line and plumbness for trestles, docks, small column footings and wall footings.

(6) Check piling is not trimmed or cut to facilitate the framing of sway or longitudinal bracing.